# Metastasis

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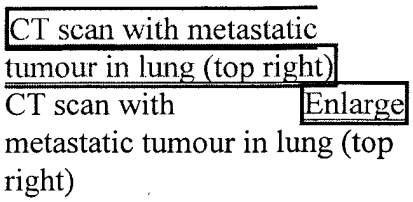
*For the musical composition, see Metastasis (Xenakis composition).*


CT scan with metastatic tumour in lung (top right)
CT scan with metastatic tumour in lung (top right) Enlarge

**Metastasis** (Greek: *change of the state*) is the spread of cancer from its primary site to other places in the body (e.g., brain, liver).

Cancer cells can break away from a primary tumor, penetrate into lymphatic and blood vessels, circulate through the bloodstream, and grow in a distant focus (metastasize) in normal tissues elsewhere in the body.

Tumors are classified as either *benign* or *malignant*. Malignant tumors can spread by invasion and metastasis while benign tumors cannot (and only grow locally). By definition, the term "cancer" applies only to malignant tumors. Still, some tumors with benign histology can behave as malignant tumors, for example in brain tumors, where treatment has to be as aggressive as with malignant disease.

Patients diagnosed with cancer want to know whether their disease is local or has spread to other locations. It is the ability to spread to other tissues and organs that makes cancer a potentially life-threatening disease, so there is great interest in understanding what makes metastasis possible for a cancerous tumor.

Metastatic tumors are very common in the late stages of cancer. The spread of metastases may occur via the blood or the lymphatics or through both routes. The most common places for the metastases to occur are the adrenals, liver, brain and the bones. There is also a propensity for certain tumors to seed in particular organs. This was first discussed as the "seed and soil" theory by Stephen Paget over a century ago in 1889. For example, prostate cancer usually metastasizes to the bones. Similarly, colon cancer has a tendency to metastasize to the liver. Stomach cancer often metastasizes to the ovary in women, where it forms a Krukenberg tumor.

When cancer cells spread to form a new tumor, it is called a secondary, or *metastatic* tumor, and its cells are like those in the original tumor. This means, for example, that if breast cancer spreads (metastasizes) to the lung, the secondary tumor is made up of abnormal breast cells (not abnormal lung cells). The disease in the lung is metastatic breast cancer (not lung cancer).

Cancer cells may spread to lymph nodes (regional lymph nodes) near the primary tumor. This is called

nodal involvement, positive nodes, or regional disease. Localized spread to regional lymph nodes near the primary tumor is not normally counted as metastasis, although this is a sign of worse prognosis.

## Contents



## Factors involved [edit]

Metastasis is a complex series of steps in which cancer cells leave the original tumor site and migrate to other parts of the body via the bloodstream or lymph system. To do so, malignant cells break away from the primary tumor and attach to and degrade proteins that make up the surrounding extracellular matrix (ECM), which separates the tumor from adjoining tissue. By degrading these proteins, cancer cells are able to breach the ECM and escape. When oral cancers metastasize, they commonly travel through the lymph system to the lymph nodes in the neck.

Cancer researchers studying the conditions necessary for cancer metastasis have discovered that one of the critical events required is the growth of a new network of blood vessels. This process of forming new blood vessels is called angiogenesis.

Tumor angiogenesis is the proliferation of a network of blood vessels that penetrates into cancerous growths, supplying nutrients and oxygen and removing waste products. Tumor angiogenesis actually starts with cancerous tumor cells releasing molecules that send signals to surrounding normal host tissue. This signaling activates certain genes in the host tissue that, in turn, make proteins to encourage growth of new blood vessels.

## Metastasis and primary cancer [edit]

Metastatis theoretically always coincides with a primary cancer. It is a tumor that started from a cancer cell or cells in another part of the body. However, over *10%* of patients presenting to oncology units will have metastases without a primary tumor found. In these cases, doctors refer to the primary tumor as "unknown" or "occult", and the patient is said to have cancer of unknown primary origin (CUP). Studies have shown that if simple questioning does not reveal the cancer's source (coughing up blood -'probably lung', urinating blood - 'probably bladder'), complex imaging will not either. In some of these cases a primary will appear later.

The use of immunohistochemistry has permitted pathologists to give an identity to many of these metastases. However, imaging of the indicated area only occasionally reveals a primary. In rare cases (e.g. of melanoma) no primary tumor is found even on autopsy. It is therefore thought that some primary tumors can regress completely, but leave their metastases behind.

## Common sites of origin [edit]

- Lung
- Breast
- Skin: Melanoma (other skin tumors rarely metastatise)
- Colon
- Kidney
- Prostate

## Diagnosis of primary and secondary tumors [edit]

The cells in a metastatic tumor resemble those in the primary tumor. Once the cancerous tissue is examined under a microscope to determine the cell type, a doctor can usually tell whether that type of cell is normally found in the part of the body from which the tissue sample was taken.

For instance, breast cancer cells look the same whether they are found in the breast or have spread to another part of the body. So, if a tissue sample taken from a tumor in the lung contains cells that look like breast cells, the doctor determines that the lung tumor is a secondary tumor. Still, the determination of the primary tumor can be often very difficult, and the pathologist may have to use several adjuvant techniques, such as immunohistochemistry, FISH (fluorescent in situ hybridization) and others. Despite the use of techniques, in some cases the primary tumor remains unidentified.

Metastatic cancers may be found at the same time as the primary tumor, or months or years later. When a second tumor is found in a patient who has been treated for cancer in the past, it is more often a metastasis than another primary tumor.

## Treatments for metastatic cancer [edit]

When cancer has metastasized, it may be treated with chemotherapy, radiation therapy, biological therapy, hormone therapy, surgery, or a combination of these. The choice of treatment generally depends on the type of primary cancer, the size and location of the metastasis, the patient's age and general health, and the types of treatments used previously. In patients diagnosed with CUP, it is still possible to treat the disease even when the primary tumor cannot be located.

Unfortunately, the treatment options currently available are rarely able to cure the patient. Some tumors, such as testicular cancer, are still curable even with metastatic disease in most cases.

## External links [edit]

- What You Need to Get Started Researching Your Options from CancerGuide
- National Cancer Institute - Q&A: Metastatic Cancer
- Cancer Forums Physicians answering questions about cancer
- Photos at: Atlas of Pathology

**Tumors** (and related structures), **Cancer**, and **Oncology**

Benign - Premalignant - Carcinoma in situ - Malignant

*Topography:* Anus - Bladder - Bone - Brain - Breast - Cervix - Colon/rectum - Duodenum - Endometrium - Esophagus - Eye - Gallbladder - Head/Neck - Liver - Larynx - Lung - Mouth - Pancreas - Penis - Prostate - Kidney - Ovaries - Skin - Stomach - Testicles - Thyroid

*Morphology:* Papilloma/carcinoma - Adenoma/adenocarcinoma - Soft tissue sarcoma - Melanoma - Fibroma/fibrosarcoma - Lipoma/liposarcoma - Leiomyoma/leiomyosarcoma - Rhabdomyoma/rhabdomyosarcoma - Mesothelioma - Angioma/angiosarcoma - Osteoma/osteosarcoma - Chondroma/chondrosarcoma - Glioma - Lymphoma/leukemia

*Treatment:* Chemotherapy - Radiation therapy - Immunotherapy - Experimental cancer treatment

*Related structures:* Cyst - Dysplasia - Hamartoma - Neoplasia - Nodule - Polyp - Pseudocyst

*Misc:* Tumor suppressor genes/oncogenes - Staging/grading - Carcinogenesis/**metastasis** - Carcinogen - Research - Paraneoplastic phenomenon - ICD-O - List of oncology-related terms



Category: Oncology

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